

Precalc Warm Up # 5-4

The second hand on the clock is 6 inches long. Find the speed of the tip of this second hand in inches per second, and also in miles per hour.



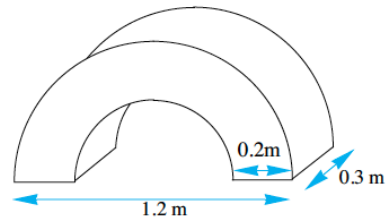
1. Find the areas and perimeters of the following sectors:

	Radius	Angle
iii.	44cm	$\frac{\pi}{4}$

vii.	324m	$\frac{\pi}{10}$
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3. The diagram shows a part of a Norman arch.
The dimensions are shown in metres.

Find the volume of stone in the arch, giving
your answer in cubic metres, correct to three
significant figures.

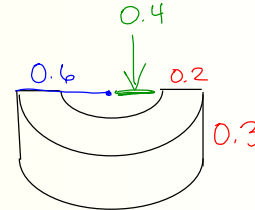


Plan: $\frac{1}{2}V_{\text{outer radius}} - \frac{1}{2}V_{\text{inner radius}}$

$$\frac{1}{2}(0.3) \pi [(0.6)^2 - (0.4)^2]$$

$$\frac{0.3 \pi}{2} (0.36 - 0.16)$$

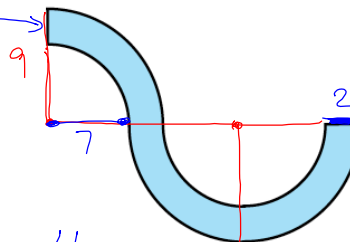
✓



$$V_{\text{cyl.}} = Bh$$

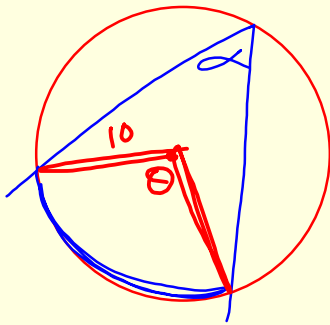
5. The diagram shows a design for a shop sign. 2
The arcs are each one quarter of a complete
circle. The radius of the smaller circle is 7 cm
and the radius of the larger circle is 9 cm.

Find the perimeter of the shape, correct to the
nearest centimetre.



$$P = \text{arcs with radius 7} + \text{arcs with radius 9} + 4$$

9. Find the angle subtended at the circumference of a circle of radius length 10 cm by an arc which forms a sector of area 75 sq. cm



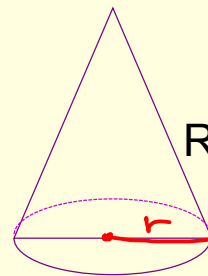
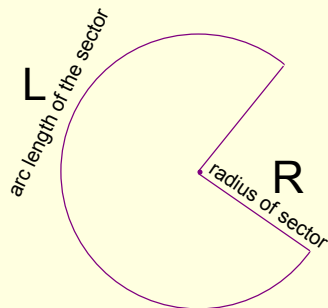
$$\alpha = \frac{1}{2}\theta$$

$$A = \frac{1}{2}\theta r^2$$

14. A sector of a circle has a radius of 15 cm and an angle of 216° . The sector is folded in such a way that it forms a cone, so that the two straight edges of the sector do not overlap.

- Find the base radius of the cone.
- Find the vertical height of the cone.
- Find the semi-vertical angle of the cone.

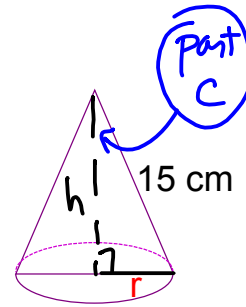
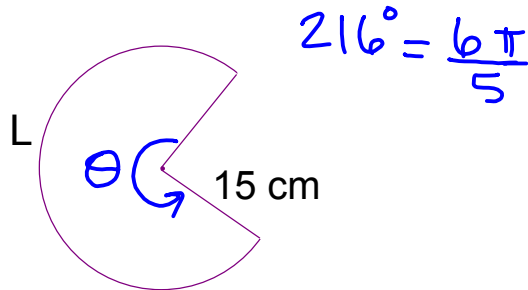
radius of sector = slant height of the cone



arc length of the sector = circumference of the cone base

$$L = 2\pi r$$

14. A sector of a circle has a radius of 15 cm and an angle of 216° . The sector is folded in such a way that it forms a cone, so that the two straight edges of the sector do not overlap.
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$$L = 2\pi r$$

A lawn roller that is 30 inches in diameter makes 1.2 revolutions per second.



Find the angular speed of the roller in radians per second.

Given: $\frac{1.2 \text{ rev.}}{\text{Sec}} \cdot \frac{1 \text{ rev}}{1 \text{ rev}}$

Goal: $\frac{\text{rad}}{\text{Sec}}$

Find the distance traveled by the roller across the lawn in inches.

A lawn roller that is 30 inches in diameter makes 1.2 revolutions per second.



Find the angular velocity of the roller in radians per second.

Given: $\frac{1.2 \text{ rev.}}{\text{Sec.}} \cdot \frac{2\pi \text{ rad}}{\text{rev.}} \approx 7.54 \frac{\text{rad}}{\text{Sec}}$ Goal

Find the linear velocity of the roller in inches per second.

Given: $\frac{1.2 \text{ rev.}}{\text{Sec.}} \cdot \frac{? \text{ in}}{\text{rev.}} = \frac{? \text{ inches}}{\text{Sec.}}$ Goal

A lawn roller that is 30 inches in diameter makes 1.2 revolutions per second.



Find the angular velocity of the roller in radians per second.

Given: $\frac{1.2 \text{ rev.}}{\text{Sec.}} \cdot \frac{2\pi \text{ rad}}{\text{rev.}} \approx 7.54 \frac{\text{rad}}{\text{Sec}}$ Goal

Find the linear velocity of the roller in inches per second.

Given: $\frac{1.2 \text{ rev.}}{\text{Sec.}} \cdot \frac{2\pi(15) \text{ inches}}{1 \text{ rev.}} = \frac{? \text{ inches}}{\text{Sec.}}$ Goal

A lawn roller that is 30 inches in diameter makes 1.2 revolutions per second.



Find the roller in radians per

We know

Goal

$$\text{Given: } \frac{1.2 \text{ rev.}}{\text{Sec}} \cdot \frac{2\pi \text{ rad}}{\text{rev.}} \approx 7.54 \frac{\text{rad}}{\text{Sec}}$$

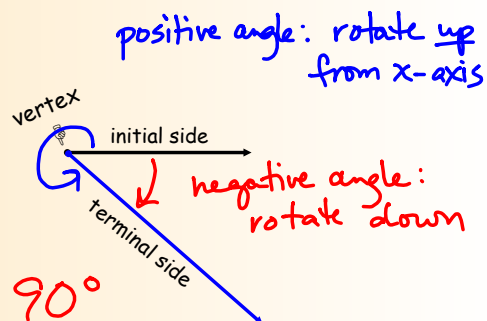
Find the distance the roller is moving across the lawn in inches

arc length

Goal

$$\text{Given: } \frac{1.2 \text{ rev.}}{\text{Sec.}} \cdot \frac{2\pi(15) \text{ inches}}{1 \text{ rev.}} \approx 113 \frac{\text{inches}}{\text{Sec.}}$$

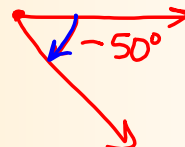
Angles are made by rotating a RAY about its endpoint.



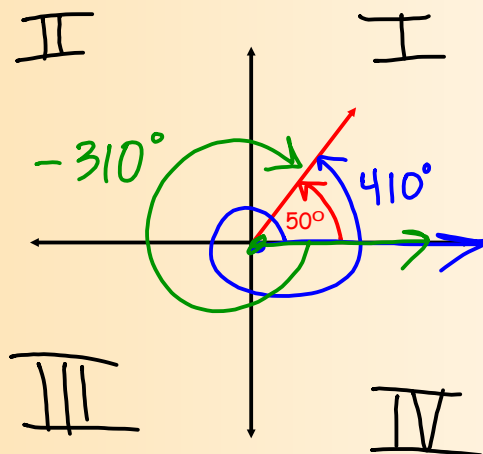
Acute? $0^\circ < \theta < 90^\circ$

Obtuse? $90^\circ < \theta < 180^\circ$

Show a 20° angle and a -50° angle



Show two angles, one positive and one negative, that are coterminal with the 50° angle below.



Name the quadrants

Review & Practice

Degrees (based on the assumption that there are 360° in a complete revolution)

Radians (based on the definition that one radian is the measure of a central angle that subtends an arc equal in length to the radius of the circle)

Conversion fractions: $\frac{180^\circ}{\pi \text{ rad}}$ or $\frac{\pi \text{ rad}}{180^\circ}$

- convert $\frac{\pi}{8}$ to degrees $\frac{\pi}{8} \cdot \frac{180^\circ}{\pi} = 22.5^\circ$
- Convert 140° to radians $140^\circ \cdot \frac{\pi}{180^\circ} = \frac{7\pi}{9}$
- Convert $147^\circ 16' 22''$ to a decimal degree $\approx 147.27^\circ$

- Convert 49.348° to DMS $49^\circ 20' 52.8''$
- Convert 0.8946 r to DMS $51^\circ 15' 24.5''$

$$(0.8946) \cdot \frac{180^\circ}{\pi}$$

$$1 \text{ rad} \approx 57^\circ$$

Review & Practice

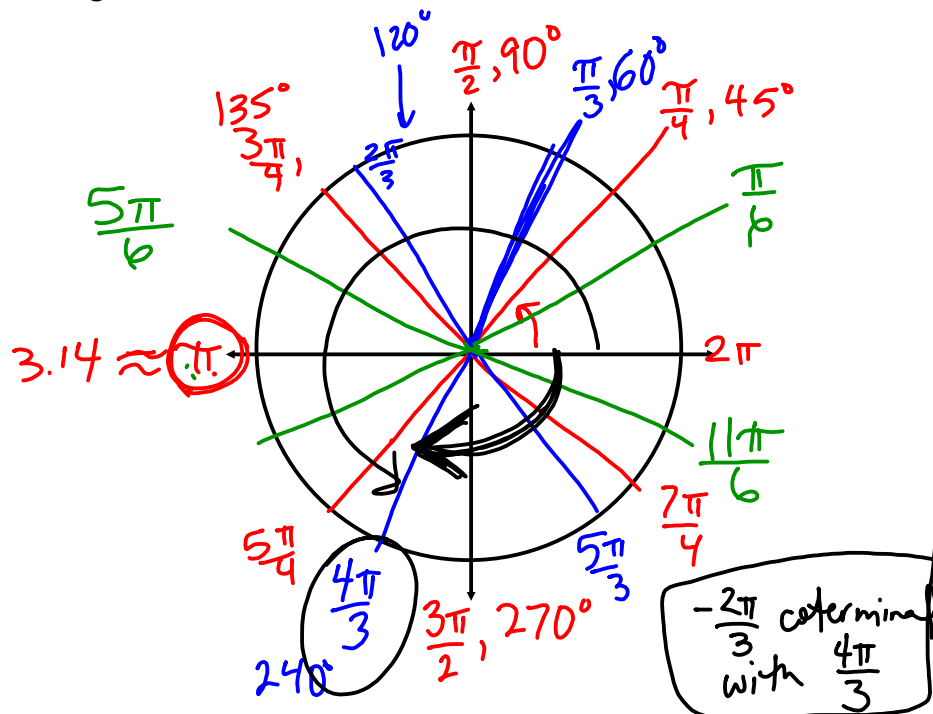
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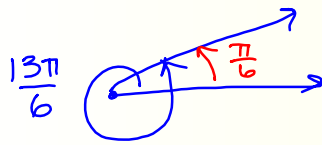
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Marking radian measures around the circle:



Sketch $\frac{13\pi}{6}$ in standard position and find 2 coterminal angles, one positive and one negative.



$$\frac{\pi}{6} - \frac{12\pi}{6} = -\frac{11\pi}{6}$$

Find the Supplement to a $\frac{5\pi}{6}$ angle

adds to π
(180°)

$$\frac{6\pi}{6} - \frac{5\pi}{6} = \boxed{\frac{\pi}{6}}$$

Find the Complement to a $\frac{2\pi}{5}$ angle $\frac{5}{5} \cdot \frac{\pi}{2} - \frac{2\pi}{5} = \frac{\pi}{10}$

adds to $\frac{\pi}{2}$
(90°)

We need radians instead of degrees to find arc lengths and area of sectors.

arc length $L = l = s = \widehat{AB}$ same units as radius

$s = \theta r$ is central angle in radians.
 \widehat{AB} = measure central angle θ
 measure

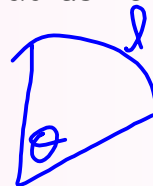
area sector $\widehat{AOB} = \frac{1}{2} \theta r^2$
 center O



Find perimeter of a sector with radius 10cm and central angle 40° $\rightarrow \frac{2\pi}{9}$

$$P = \frac{20\pi}{9} + 20 \text{ cm}$$

$$\approx 26.48 \text{ cm}$$



HW: PC book p. 309

boxed and #5, 65, 75

(skip 35-45)